



Lowell Regional Wastewater
451 First Street Boulevard
Lowell, MA 01854
Attn: Tom Kawa

8/10/2018

Dear Mr. Kawa,

Enclosed please find the toxicological evaluation and chemical analyses report for the effluent received on July 18, 2018. This is your 2018 Stormwater bioassay report. Please call me at (401) 353-3420 if you have any questions.

Sincerely,

Michael McCallum
Technical Laboratory Director

NEW ENGLAND TESTING LABORATORY, INC.

59 Greenhill St., West Warwick, RI 02893

(401) 353-3420

TOXICOLOGICAL EVALUATION
AND CHEMICAL ANALYSES
OF EFFLUENT:
NPDES Permit # MA0100633
Stormwater 2018 Sample

Prepared For:
Lowell Regional Wastewater
451 First Street Boulevard
Lowell, MA 01854

August 10, 2018

By
New England Testing Laboratory, Inc.
59 Greenhill Street
West Warwick, RI 02893

NETLAB CASE NUMBER: 8G18004



New England Bioassay

A Division of GZA



GEOTECHNICAL

ENVIRONMENTAL

ECOLOGICAL

WATER

CONSTRUCTION
MANAGEMENT

77 Batson Drive
Manchester, CT 06042
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ACUTE AQUATIC TOXICITY TEST REPORT

**Lowell Regional Wastewater Utilities
Lowell, Massachusetts
NPDES Permit: MA0100633**

Test Start Date: 7/18/18

Test Period: July 2018

Report Prepared by:

New England Bioassay
A Division of GZA GeoEnvironmental, Inc.
77 Batson Drive
Manchester, CT 06042

NEB Project Number: 05.0044476.00

Report Date: August 8, 2018

Report Submitted to:

New England Testing Laboratories
59 Greenhill Street
West Warwick, RI 02893

Sample ID: Stormwater

This report shall not be reproduced, except in its entirety, without written approval of New England Bioassay (NEB). NEB is the sole authority for authorizing edits or modifications to the data contained in this report. Test results relate only to samples analyzed. Please contact the Lab Manager, Kimberly Wills, at 860-858-3153 or kimberly.wills@gza.com if you have any questions concerning these results.

Whole Effluent Toxicity Testing Report Instruction Form

Client Name/Project: NET/Lowell Test Date: 7/18/18

Sample ID: Semi-annual Stormwater

Your results were as follows:

☒ Pass

- ☐ Fail – Please proceed according to the instructions in your permit.
- ☐ Invalid – **Retesting is still required. Retest report will be sent at a later date under separate cover.**
- ☐ Original Test Invalid – **Valid retest performed. Both test and retest results are attached.**
- ☐ Retesting will be or has been performed according to the Case 1 Protocols outlined in the attached copy of EPA-New England's species-specific, self-implementing policy for alternate dilution water.
- ☐ This is your _____ case of dilution water toxicity. Please proceed according to the Case 2 Protocols outlined in the attached copy of EPA-New England's species-specific, self-implementing policy for alternate dilution water. The alternate dilution water you select for future tests for this species should be described as follows: "synthetic laboratory water made up according to EPA's toxicity test protocols, by adding specified amounts of salts into deionized water in order to match the hardness of our receiving water." Writing this letter should help you to avoid retests in the future.
- ☐ Available information is insufficient to determine whether this test passed or failed. Please compare results to your permit limits. Please submit a current copy of your permit to the NEB Lab so that we can determine the status of future tests results and help ensure your compliance with permit requirements.

Please complete the items on this list before reporting these results according to the instructions in the "Monitoring and Reporting" Section of your permit.

- Please complete, sign and date the upper portion of the "Whole Effluent Toxicity Test Report Certification" page which is the page directly following this page.
- Fill in the Sample Type and Sample Method (upper right) and the Permit Limits (lower left) on the New England Bioassay, Inc.-EPA Toxicity Test Summary Sheet(s) if they are incomplete.
- Fill in any missing information on the NEB Chain-of-Custody documents. This includes ensuring that the following information is recorded: Sampler's name and title, Facility name and address, Sample collection methods, Sample collection start and end dates and times, Types of sample, Chlorination status of samples upon shipment to NEB, Site description and Sample collection procedures.
- Monitoring results should be summarized on your monthly Discharge Monitoring Report Form.
- Signed and dated originals of this report must be submitted to the State (and Federal) Agencies specified in the "Monitoring and Reporting" section of your permit.

Questions? Please contact the Lab Manager, Kim Wills, at (860) 643-9560 or kimberly.wills@gza.com.

WHOLE EFFLUENT TOXICITY TEST REPORT CERTIFICATION (Permittee)

I certify under penalty of law that this document and all ATTACHMENTS were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on _____

[Date]

[Authorized Signature]

[Print or Type Name and Title]

[Print or Type the Permittee's Name]

[Print or Type the NPDES Permit No.]

Since the WET test and report check is complicated, the New England Bioassay Aquatic Toxicity Laboratory has certified the validity of the WET test data in the section below. Please note that this does not relieve the permittee from its responsibility to sign and certify the report under 40 C.F.R. S 122.41(k).

WHOLE EFFLUENT TOXICITY TEST REPORT CERTIFICATION (Bioassay Laboratory)

I certify under penalty of law that this document and all ATTACHMENTS were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on _____

[Date]

[Authorized Signature]

Kim Wills, Laboratory Manager

[Print or Type Name and Title]

New England Bioassay

[Print or Type Name of Bioassay Laboratory]

24. Telephone Contacts

If you have questions, please contact Joy Hilton, Water Technical Unit, at (617) 918-1877 or David McDonald, Ecosystem Assessment Unit, at (617) 918-8609.

NEW ENGLAND BIOASSAY, A DIVISION OF GZA EPA TEST SUMMARY SHEET

Facility Name: Lowell RWWU Test Start Date: 7/18/18
 NPDES Permit Number: MA0100633 Outfall Number: _____

| <u>Test Type</u> | <u>Test Species</u> | <u>Sample Type</u> | <u>Sample Method</u> |
|---|--|---|--|
| <input checked="" type="checkbox"/> Acute | <input type="checkbox"/> Fathead Minnow | <input type="checkbox"/> Prechlorinated | <input checked="" type="checkbox"/> Grab |
| <input type="checkbox"/> Chronic | <input checked="" type="checkbox"/> Ceriodaphnia | <input checked="" type="checkbox"/> Dechlorinated | <input type="checkbox"/> Composite |
| <input type="checkbox"/> Modified | <input type="checkbox"/> Daphnia Pulex | <input type="checkbox"/> Chlorine Spiked in Lab | <input type="checkbox"/> Flowthru |
| <input type="checkbox"/> (chronic reporting | <input type="checkbox"/> Mysid Shrimp | <input type="checkbox"/> Chlorinated on site | <input type="checkbox"/> Other |
| <input type="checkbox"/> acute values) | <input type="checkbox"/> Sheepshead | <input type="checkbox"/> Unchlorinated | |
| <input type="checkbox"/> 24hr screening | <input type="checkbox"/> Menidia | | |
| | <input type="checkbox"/> Sea Urchin | | |
| | <input type="checkbox"/> Champia | | |
| | <input type="checkbox"/> Selenastrum | | |

Dilution Water

- ☐ receiving water collected at a point upstream of or away from the discharge, free from toxicity or other sources of contamination; (Receiving water name: _____)
- ☐ alternate surface water of known quality and a hardness, etc. to generally reflect the characteristics of the receiving water; (Surface water name: _____)
- ☒ synthetic water prepared using either Millipore Mill-Q or equivalent deionized water and reagent grade chemicals; or deionized water combined with mineral water;
- ☐ or artificial sea salts mixed with deionized water;
- ☐ deionized water and hypersaline brine; or
- ☐ other _____

Effluent sampling date (s): 7/17/18

Effluent concentrations tested (in%): 0 6.25 12.5 25 50 100

* Permit limit concentration: ≥ 100%

Was effluent salinity adjusted? No If yes, to what value? N/A ppt

With sea salts? N/A Hypersaline brine solution? N/A

Actual effluent concentrations tested after salinity adjustment (%): 0 6.25 12.5 25 50 100

Reference Toxicant test date: 7/11/18

Test Acceptability Criteria

| | |
|-----------------------------------|---------------------------------------|
| Mean Control Survival: <u>N/A</u> | Mean Control Reproduction: <u>N/A</u> |
| Mean Diluent Survival: <u>90%</u> | Mean Diluent Reproduction: <u>N/A</u> |
| Mean Control Weight: <u>N/A</u> | Mean Control Cell Count: <u>N/A</u> |
| Mean Diluent Weight: <u>N/A</u> | Mean Diluent Cell Count: <u>N/A</u> |

| | <u>Limits</u> | | <u>Results</u> |
|--------|---------------|---------------|------------------|
| LC50 | <u>≥ 100%</u> | LC50 | <u>>100%</u> |
| | | Upper Value | <u>±∞</u> |
| | | Lower Value | <u>100%</u> |
| | | Data Analysis | |
| | | Method Used | <u>Graphical</u> |
| A-NOEC | <u>N/A</u> | A-NOEC | <u>100%</u> |
| C-NOEC | <u>N/A</u> | C-NOEC | <u>-----</u> |
| | | LOEC | <u>-----</u> |
| IC25 | <u>N/A</u> | IC25 | <u>-----</u> |
| IC50 | <u>N/A</u> | IC50 | <u>-----</u> |

CERIODAPHNIA DUBIA AQUATIC TOXICITY TEST REPORT

Test Reference Manual: EPA 821-R-02-012, "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater Organisms and Marine Organisms", Fifth Edition

Test Method: *Ceriodaphnia dubia* Acute Toxicity Test – Method 2002.0

Test Type: Acute Static Non-Renewal Freshwater Test

Temperature : 25 ± 1°C

Light Quality: Ambient Laboratory Illumination

Photoperiod: 16 hours light, 8 hours dark

Test Chamber Size: 30 mL

Test Solution Volume: Minimum 25 mL

Age of Test Organisms: 1-24 hours (neonates)

Number of Daphnids Per Test Chamber: 5

Number of Replicate Test Chambers Per Treatment: 4

Total Number of Daphnids Per Test Concentration: 20

Feeding Regime: Fed YCT and *Selenastrum* while holding prior to initiating test as per manual.

Aeration: None

Dilution Water: NEB Lab Synthetic Soft Water (hardness 40 to 48 mg/L)

Effluent Concentrations: 0%, 6.25%, 12.5%, 25%, 50% and 100% effluent

Test Duration: 48 hours

Effect measured: Mortality – no movement of body/appendages on gentle prodding.

Test Acceptability: ≥ 90% survival of test organisms in control solution Yes X No _

Sampling Requirements: Samples first used within 36 hours of collection Yes X No _

Sample Volume Required: Minimum 1 liter

Test Organism Source: NEB

Test Acceptability Criteria: Mean Alternate Water Control Survival = N/A
Mean Dilution Water Control Survival = 90%

| <u>Test Results:</u> | <u>Limits</u> | <u>Results</u> | <u>Status</u> |
|---------------------------|---------------|------------------|------------------------------|
| 48-hour LC50 | ≥ 100% | <u>>100%</u> | Pass <u>X</u> Fail <u> </u> |
| Upper Value | | <u>±∞</u> | |
| Lower Value | | <u>100%</u> | |
| Data Analysis Method Used | | <u>Graphical</u> | |
| A-NOEC | | <u>100%</u> | |

| | | |
|--|------------------------------------|-------------------------------|
| <u>Reference Toxicant Data:</u> | <u>Date:</u> | <u>7/11/18</u> |
| | <u>Toxicant:</u> | Sodium Chloride |
| | <u>Dilution Water:</u> | NEB Lab Synthetic Soft Water |
| | <u>Source:</u> | New England Bioassay |
| | <u>48-hour LC50:</u> | <u>1.74 g/L</u> |
| | <u>In Acceptable Range:</u> | Yes <u>X</u> No <u> </u> |

Dechlorination Procedures: Chlorine is measured using 4500 CL-G DPD Colorimetric Method.

X Dechlorination was not required

_ Sample was dechlorinated by adding sodium thiosulfate to the sample prior to test initiation. Since dechlorination of the effluent was necessary, a thiosulfate control of diluent water spiked with sodium thiosulfate was also included in the test series. Chlorine was _____ mg/L in a dechlorinated sample.

Chlorine Measurement was elevated due to interference. Chlorine was _____ mg/L in a filtered sample.

Total Residual Chlorine was re-measured following aeration, and was found to be _____ mg/L.

Additional Notes or Other Conditions Affecting the Test:

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM

COVER SHEET FOR LC50 TESTS

CLIENT: New England Testing Laboratory
 ADDRESS: 59 Greenhill Street
West Warwick, RI 02893
 SAMPLE TYPE: Lowell RWU Stormwater
 DILUTION WATER: Soft Reconstituted Freshwater

C. dubia TEST ID # 18-1044
 COC # C38-2819
 PROJECT # 05.0044476.00

Sample Date(s): 7/17/18 Date Received: 7/18/18

INVERTEBRATES

TEST SET UP (TECH INIT) PD
 TEST SPECIES *Ceriodaphnia dubia*
 NEB LOT# Cd18(7-18)
 AGE < 24 hours
 TEST SOLUTION VOLUME (mls) 30
 NO. ORGANISMS PER TEST CHAMBER 5
 NO. ORGANISMS PER CONCENTRATION 20
 NO. ORGANISMS PER CONTROL 20

LABORATORY CONTROL WATER:

Hardness mg/L CaCO₃ Alkalinity mg/L CaCO₃

ARTIFICIAL FW:

NEB BATCH #

| | | |
|----------|----|----|
| C38-S015 | 48 | 35 |
|----------|----|----|

| | DATE | TIME |
|-------------|---------|------|
| TEST START: | 7/18/18 | 1600 |
| TEST END: | 7/20/18 | 1543 |

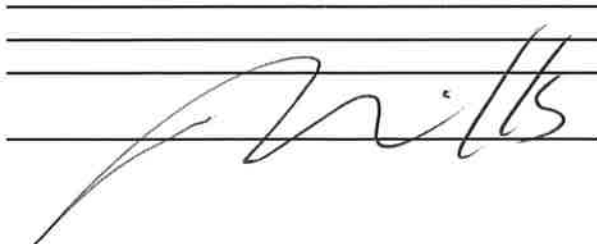
RESULTS OF *Ceriodaphnia dubia* LC50 TEST

| METHOD | LC50 (%) | 95% Confidence Limits |
|--------------------|----------|-----------------------|
| BINOMIAL/GRAPHICAL | >100% | 100%±∞ |
| PROBIT | | |
| SPEARMAN KARBUR | | |
| NOAEL | 100% | |

NOEC: NO OBSERVABLE EFFECT CONCENTRATION

Comments:

REVIEWD BY:



DATE:

8/8/18

**NEW ENGLAND BIOASSAY
Toxicity Test Data Sheet**

NEB Test #: 18-1044

Project #: 05.0044476.00

Facility Name: Lowell RWU Stormwater

Date Sampled: 7/17/18

Date Received: 7/18/18

Sample ID: Stormwater

Test Organism: Ceriodaphnia dubia

Organism Age: < 24 hours

Test Duration: 48 (hours)

Beginning Date: 7/18/18 Time: 1600

Dilution Water Source: SRCF

Dilution Hardness: 48 ppm as CaCO₃

| Effluent Conc. % | Number of Surviving Organisms | | | Dissolved Oxygen (mg/L) | | | Temperature (°C) | | | pH | | |
|------------------|-------------------------------|----|----|-------------------------|-----|-----|--------------------|------|------|-----|-----|-----|
| | PD | DD | DD | PD | DD | DD | PD | DD | DD | PD | DD | DD |
| Initials | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 |
| Diluent A | 5 | 5 | 5 | 8.1 | 8.1 | 7.9 | 25.7 | 25.4 | 26.0 | 7.4 | 7.6 | 7.5 |
| Diluent B | 5 | 5 | 4 | | | 8.0 | | | 26.0 | | | 7.5 |
| Diluent C | 5 | 5 | 4 | | | 8.0 | | | 26.0 | | | 7.5 |
| Diluent D | 5 | 5 | 5 | | | 8.1 | | | 26.0 | | | 7.5 |
| 6.25 A | 5 | 5 | 5 | 8.1 | 8.1 | 8.0 | 25.8 | 25.1 | 26.0 | 7.3 | 7.5 | 7.4 |
| 6.25 B | 5 | 5 | 5 | | | 8.0 | | | 26.0 | | | 7.4 |
| 6.25 C | 5 | 5 | 5 | | | 8.0 | | | 26.0 | | | 7.5 |
| 6.25 D | 5 | 5 | 5 | | | 8.1 | | | 26.0 | | | 7.5 |
| 12.5 A | 5 | 5 | 5 | 8.1 | 7.6 | 8.0 | 25.8 | 25.6 | 26.0 | 7.3 | 7.5 | 7.4 |
| 12.5 B | 5 | 5 | 5 | | | 7.8 | | | 26.0 | | | 7.4 |
| 12.5 C | 5 | 5 | 5 | | | 7.9 | | | 26.0 | | | 7.5 |
| 12.5 D | 5 | 5 | 5 | | | 7.9 | | | 26.0 | | | 7.5 |
| 25 A | 5 | 5 | 5 | 8.3 | 7.4 | 7.9 | 25.8 | 25.4 | 26.0 | 7.2 | 7.5 | 7.4 |
| 25 B | 5 | 5 | 5 | | | 7.6 | | | 26.0 | | | 7.5 |
| 25 C | 5 | 5 | 5 | | | 7.7 | | | 26.0 | | | 7.5 |
| 25 D | 5 | 5 | 5 | | | 7.7 | | | 26.0 | | | 7.5 |
| 50 A | 5 | 5 | 5 | 8.5 | 6.1 | 7.7 | 25.9 | 25.8 | 26.0 | 7.1 | 7.5 | 7.5 |
| 50 B | 5 | 5 | 5 | | | 7.1 | | | 26.0 | | | 7.5 |
| 50 C | 5 | 5 | 5 | | | 7.1 | | | 26.0 | | | 7.5 |
| 50 D | 5 | 5 | 5 | | | 7.1 | | | 26.0 | | | 7.5 |

| | | | |
|-------|---------------------|--------|----------------------|
| LC50 | Confidence Interval | A-NOEC | Computational Method |
| >100% | 100%±∞ | 100% | Graphical |

Toxicity Test Data Sheet

NEB Test #: 18-1044

Test Organism: Ceriodaphnia dubia

Project #: 05.0044476.00

Organism Age: < 24 hours

Facility Name: Lowell RWU Stormwater

Test Duration: 48 (hours)

Date Sampled: 7/17/18

Beginning Date: 7/18/18 Time: 1600

Date Received: 7/18/18

Dilution Water Source: SRCF

Sample ID: Stormwater

Dilution Hardness: 48 ppm as CaCO₃

[illegible]

| | | | |
|-------|---------------------|--------|----------------------|
| LC50 | Confidence Interval | A-NOEC | Computational Method |
| >100% | 100% $\pm\infty$ | 100% | Graphical |

CETIS Analytical Report

Report Date: 02 Aug-18 14:26 (p 1 of 2)
Test Code/ID: 18-1044 / 20-4873-4077

Ceriodaphnia 48-h Acute Survival Test

New England Bioassay

| | | |
|-------------------------------|--|-----------------------------------|
| Analysis ID: 14-0619-2526 | Endpoint: 48h Survival Rate | CETIS Version: CETISv1.9.4 |
| Analyzed: 02 Aug-18 14:25 | Analysis: Linear Interpolation (ICPIN) | Status Level: 1 |
| Batch ID: 03-2099-5807 | Test Type: Survival (48h) | Analyst: |
| Start Date: 18 Jul-18 16:00 | Protocol: EPA/821/R-02-012 (2002) | Diluent: Laboratory Water |
| Ending Date: 20 Jul-18 15:43 | Species: Ceriodaphnia dubia | Brine: |
| Test Length: 48h | Taxon: Branchiopoda | Source: In-House Culture Age: <24 |
| Sample ID: 10-6117-4001 | Code: 3F403AF1 | Project: |
| Sample Date: 17 Jul-18 15:00 | Material: stormwater | Source: Lowell RWWU (MA0100633) |
| Receipt Date: 18 Jul-18 14:45 | CAS (PC): | Station: |
| Sample Age: 25h | Client: New England Testing Labs | |

Linear Interpolation Options

| X Transform | Y Transform | Seed | Resamples | Exp 95% CL | Method |
|-------------|-------------|---------|-----------|------------|-------------------------|
| Log(X) | Linear | 1798581 | 200 | Yes | Two-Point Interpolation |

Test Acceptability Criteria

| | | TAC Limits | | | |
|--------------|-----------|------------|-------|---------|-----------------|
| Attribute | Test Stat | Lower | Upper | Overlap | Decision |
| Control Resp | 0.9 | 0.9 | >> | Yes | Passes Criteria |

Point Estimates

| Level | % | 95% LCL | 95% UCL | TU | 95% LCL | 95% UCL |
|-------|------|---------|---------|----|---------|---------|
| LC50 | >100 | n/a | n/a | <1 | n/a | n/a |

48h Survival Rate Summary

| | | | Calculated Variate(A/B) | | | | | | | Isotonic Variate | |
|--------|------|-------|-------------------------|--------|--------|---------|--------|---------|-------|------------------|---------|
| Conc-% | Code | Count | Mean | Min | Max | Std Dev | CV% | %Effect | A/B | Mean | %Effect |
| 0 | D | 4 | 0.9000 | 0.8000 | 1.0000 | 0.1155 | 12.83% | 0.0% | 18/20 | 0.9833 | 0.0% |
| 6.25 | | 4 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% | 20/20 | 0.9833 | 0.0% |
| 12.5 | | 4 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% | 20/20 | 0.9833 | 0.0% |
| 25 | | 4 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% | 20/20 | 0.9833 | 0.0% |
| 50 | | 4 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% | 20/20 | 0.9833 | 0.0% |
| 100 | | 4 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% | 20/20 | 0.9833 | 0.0% |

48h Survival Rate Detail

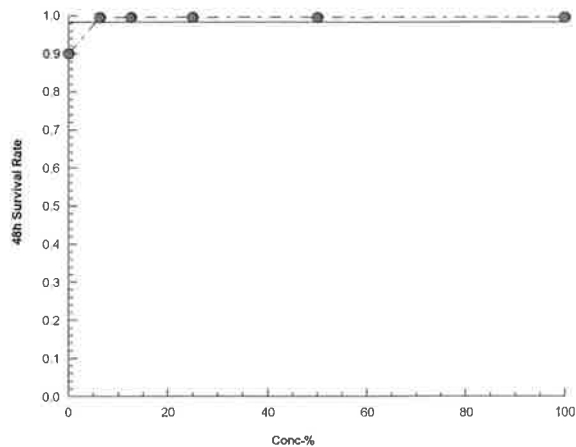
| Conc-% | Code | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|--------|------|--------|--------|--------|--------|
| 0 | D | 1.0000 | 0.8000 | 0.8000 | 1.0000 |
| 6.25 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 12.5 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 25 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 50 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 100 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

48h Survival Rate Binomials

| Conc-% | Code | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|--------|------|-------|-------|-------|-------|
| 0 | D | 5/5 | 4/5 | 4/5 | 5/5 |
| 6.25 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 12.5 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 25 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 50 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 100 | | 5/5 | 5/5 | 5/5 | 5/5 |

| | | | |
|---------------------------------------|--|----------------------------|----------------------|
| Ceriodaphnia 48-h Acute Survival Test | | | New England Bioassay |
| Analysis ID: 14-0619-2526 | Endpoint: 48h Survival Rate | CETIS Version: CETISv1.9.4 | |
| Analyzed: 02 Aug-18 14:25 | Analysis: Linear Interpolation (ICPIN) | Status Level: 1 | |

Graphics



CETIS Analytical Report

Report Date: 02 Aug-18 14:26 (p 1 of 2)
Test Code/ID: 18-1044 / 20-4873-4077

Ceriodaphnia 48-h Acute Survival Test

New England Bioassay

| | | |
|-------------------------------|--|-----------------------------------|
| Analysis ID: 19-4607-8808 | Endpoint: 48h Survival Rate | CETIS Version: CETISv1.9.4 |
| Analyzed: 02 Aug-18 14:25 | Analysis: Parametric-Control vs Treatments | Status Level: 1 |
| Batch ID: 03-2099-5807 | Test Type: Survival (48h) | Analyst: |
| Start Date: 18 Jul-18 16:00 | Protocol: EPA/821/R-02-012 (2002) | Diluent: Laboratory Water |
| Ending Date: 20 Jul-18 15:43 | Species: Ceriodaphnia dubia | Brine: |
| Test Length: 48h | Taxon: Branchiopoda | Source: In-House Culture Age: <24 |
| Sample ID: 10-6117-4001 | Code: 3F403AF1 | Project: |
| Sample Date: 17 Jul-18 15:00 | Material: stormwater | Source: Lowell RWWU (MA0100633) |
| Receipt Date: 18 Jul-18 14:45 | CAS (PC): | Station: |
| Sample Age: 25h | Client: New England Testing Labs | |

| Data Transform | Alt Hyp | NOEL | LOEL | TOEL | TU | PMSD |
|---------------------|---------|------|------|------|----|-------|
| Angular (Corrected) | C > T | 100 | >100 | n/a | 1 | 9.06% |

Dunnett Multiple Comparison Test

| Control | vs | Conc-% | Test Stat | Critical | MSD | DF | P-Type | P-Value | Decision(α:5%) |
|----------------|----|--------|-----------|----------|-------|----|--------|---------|------------------------|
| Dilution Water | | 6.25 | -3 | 2.407 | 0.096 | 6 | CDF | 1.0000 | Non-Significant Effect |
| | | 12.5 | -3 | 2.407 | 0.096 | 6 | CDF | 1.0000 | Non-Significant Effect |
| | | 25 | -3 | 2.407 | 0.096 | 6 | CDF | 1.0000 | Non-Significant Effect |
| | | 50 | -3 | 2.407 | 0.096 | 6 | CDF | 1.0000 | Non-Significant Effect |
| | | 100 | -3 | 2.407 | 0.096 | 6 | CDF | 1.0000 | Non-Significant Effect |

Test Acceptability Criteria

TAC Limits

| Attribute | Test Stat | Lower | Upper | Overlap | Decision |
|--------------|-----------|-------|-------|---------|-----------------|
| Control Resp | 0.9 | 0.9 | >> | Yes | Passes Criteria |

ANOVA Table

| Source | Sum Squares | Mean Square | DF | F Stat | P-Value | Decision(α:5%) |
|---------|-------------|-------------|----|--------|---------|--------------------|
| Between | 0.0472566 | 0.0094513 | 5 | 3 | 0.0384 | Significant Effect |
| Error | 0.0567079 | 0.0031504 | 18 | | | |
| Total | 0.103964 | | 23 | | | |

Distributional Tests

| Attribute | Test | Test Stat | Critical | P-Value | Decision(α:1%) |
|--------------|-------------------------------|-----------|----------|---------|-------------------------|
| Distribution | Shapiro-Wilk W Normality Test | 0.5784 | 0.884 | 3.6E-07 | Non-Normal Distribution |

48h Survival Rate Summary

| Conc-% | Code | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|--------|------|-------|--------|---------|---------|--------|--------|--------|---------|--------|---------|
| 0 | D | 4 | 0.9000 | 0.7163 | 1.0000 | 0.9000 | 0.8000 | 1.0000 | 0.0577 | 12.83% | 0.00% |
| 6.25 | | 4 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% |
| 12.5 | | 4 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% |
| 25 | | 4 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% |
| 50 | | 4 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% |
| 100 | | 4 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.0000 | 0.00% | -11.11% |

Angular (Corrected) Transformed Summary

| Conc-% | Code | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|--------|------|-------|-------|---------|---------|--------|-------|-------|---------|--------|---------|
| 0 | D | 4 | 1.226 | 1.007 | 1.445 | 1.226 | 1.107 | 1.345 | 0.06874 | 11.21% | 0.00% |
| 6.25 | | 4 | 1.345 | 1.345 | 1.346 | 1.345 | 1.345 | 1.345 | 0 | 0.00% | -9.71% |
| 12.5 | | 4 | 1.345 | 1.345 | 1.346 | 1.345 | 1.345 | 1.345 | 0 | 0.00% | -9.71% |
| 25 | | 4 | 1.345 | 1.345 | 1.346 | 1.345 | 1.345 | 1.345 | 0 | 0.00% | -9.71% |
| 50 | | 4 | 1.345 | 1.345 | 1.346 | 1.345 | 1.345 | 1.345 | 0 | 0.00% | -9.71% |
| 100 | | 4 | 1.345 | 1.345 | 1.346 | 1.345 | 1.345 | 1.345 | 0 | 0.00% | -9.71% |

CETIS Analytical Report

Report Date: 02 Aug-18 14:26 (p 2 of 2)
Test Code/ID: 18-1044 / 20-4873-4077

Ceriodaphnia 48-h Acute Survival Test

New England Bioassay

Analysis ID: 19-4607-8808 Endpoint: 48h Survival Rate CETIS Version: CETISv1.9.4
Analyzed: 02 Aug-18 14:25 Analysis: Parametric-Control vs Treatments Status Level: 1

48h Survival Rate Detail

| Conc-% | Code | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|--------|------|--------|--------|--------|--------|
| 0 | D | 1.0000 | 0.8000 | 0.8000 | 1.0000 |
| 6.25 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 12.5 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 25 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 50 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 100 | | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

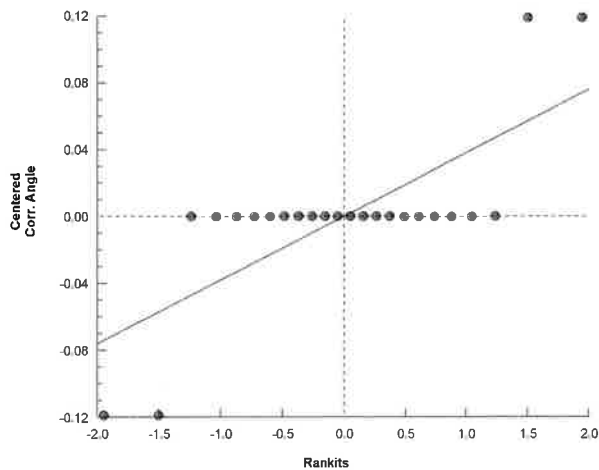
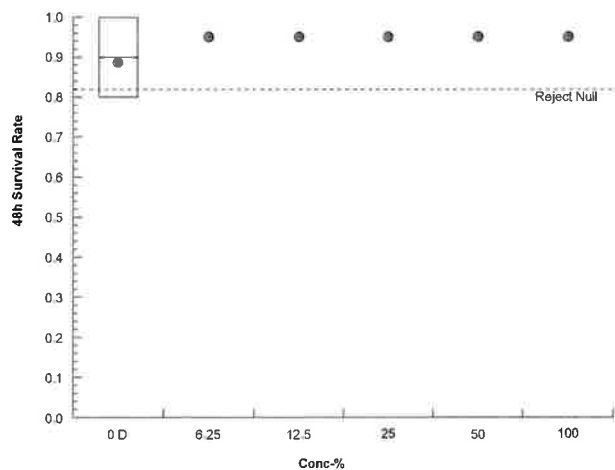
Angular (Corrected) Transformed Detail

| Conc-% | Code | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|--------|------|-------|-------|-------|-------|
| 0 | D | 1.345 | 1.107 | 1.107 | 1.345 |
| 6.25 | | 1.345 | 1.345 | 1.345 | 1.345 |
| 12.5 | | 1.345 | 1.345 | 1.345 | 1.345 |
| 25 | | 1.345 | 1.345 | 1.345 | 1.345 |
| 50 | | 1.345 | 1.345 | 1.345 | 1.345 |
| 100 | | 1.345 | 1.345 | 1.345 | 1.345 |

48h Survival Rate Binomials

| Conc-% | Code | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|--------|------|-------|-------|-------|-------|
| 0 | D | 5/5 | 4/5 | 4/5 | 5/5 |
| 6.25 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 12.5 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 25 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 50 | | 5/5 | 5/5 | 5/5 | 5/5 |
| 100 | | 5/5 | 5/5 | 5/5 | 5/5 |

Graphics



INITIAL CHEMISTRY INFORMATION

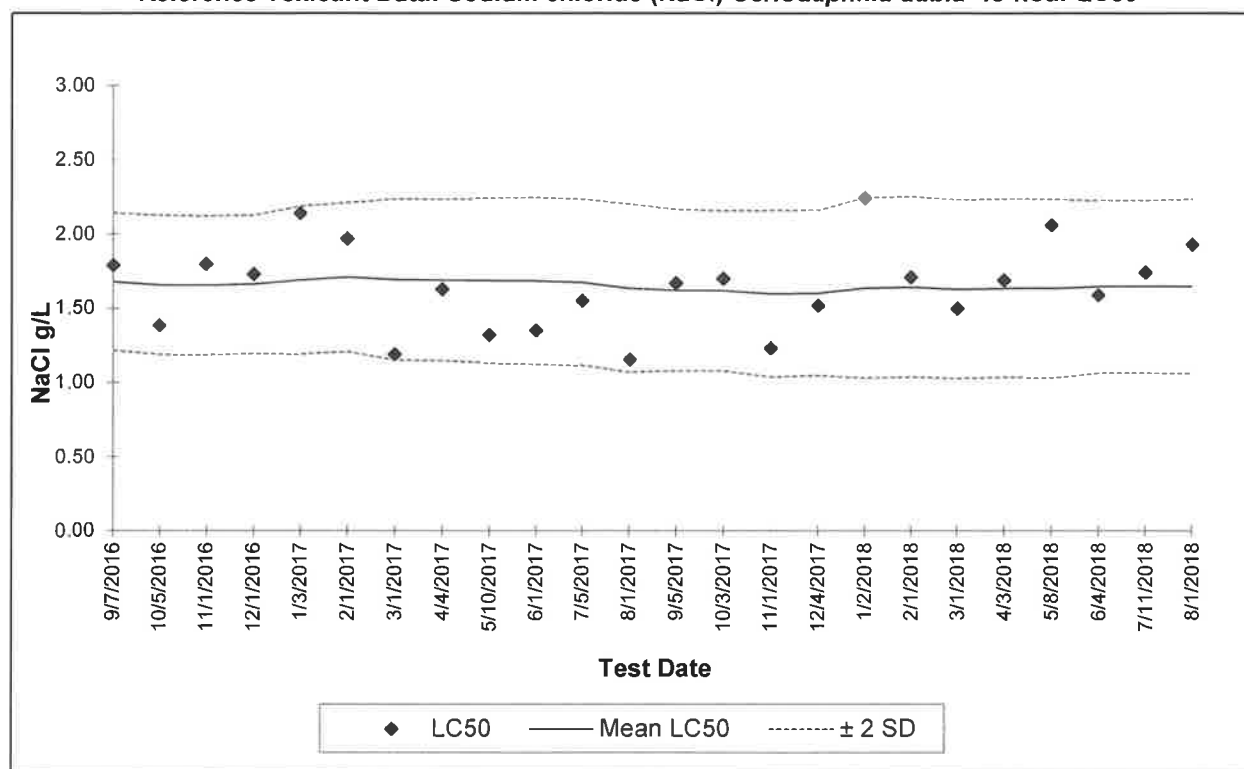
CLIENT:
PROJECT #

Lowell Stormwater
05.0044476.00

| | |
|---|----------|
| RECIPT DATE | 7/18/18 |
| SAMPLE | Effluent |
| COC # | C38-2819 |
| Temperature (°C) | 3.6 |
| Dissolved Oxygen (mg/L) | 9.4 |
| pH (standard units) | 7.0 |
| Conductivity (µmhos/cm) | 907 |
| Salinity (ppt) | <1 |
| Hardness (as mg/L CaCO ₃) | 66 |
| Alkalinity (as mg/L CaCO ₃) | 95 |
| TRC - DPD (mg/L) | 0.002 |
| INITIALS | MM |

Additional notes:

New England Bioassay
Reference Toxicant Data: Sodium chloride (NaCl) *Ceriodaphnia dubia* 48-hour LC50



| Test ID | Date | LC ₅₀ | Mean LC ₅₀ | STD | -2 STD | +2 STD | CV | CV National 75th % | CV National 90th % |
|---------|-----------|------------------|-----------------------|------|--------|--------|------|-----------------------|-----------------------|
| 16-1252 | 9/7/2016 | 1.79 | 1.68 | 0.23 | 1.22 | 2.14 | 0.14 | 0.29 | 0.34 |
| 16-1466 | 10/5/2016 | 1.39 | 1.66 | 0.23 | 1.19 | 2.13 | 0.14 | 0.29 | 0.34 |
| 16-1586 | 11/1/2016 | 1.80 | 1.66 | 0.23 | 1.19 | 2.12 | 0.14 | 0.29 | 0.34 |
| 16-1730 | 12/1/2016 | 1.73 | 1.66 | 0.23 | 1.20 | 2.13 | 0.14 | 0.29 | 0.34 |
| 17-5 | 1/3/2017 | 2.14 | 1.69 | 0.25 | 1.19 | 2.19 | 0.15 | 0.29 | 0.34 |
| 17-147 | 2/1/2017 | 1.97 | 1.71 | 0.25 | 1.21 | 2.21 | 0.15 | 0.29 | 0.34 |
| 17-274 | 3/1/2017 | 1.19 | 1.69 | 0.27 | 1.15 | 2.24 | 0.16 | 0.29 | 0.34 |
| 17-475 | 4/4/2017 | 1.63 | 1.69 | 0.27 | 1.15 | 2.23 | 0.16 | 0.29 | 0.34 |
| 17-695 | 5/10/2017 | 1.32 | 1.69 | 0.28 | 1.13 | 2.24 | 0.16 | 0.29 | 0.34 |
| 17-772 | 6/1/2017 | 1.35 | 1.68 | 0.28 | 1.13 | 2.24 | 0.17 | 0.29 | 0.34 |
| 17-968 | 7/5/2017 | 1.55 | 1.67 | 0.28 | 1.12 | 2.23 | 0.17 | 0.29 | 0.34 |
| 17-1140 | 8/1/2017 | 1.16 | 1.64 | 0.28 | 1.07 | 2.20 | 0.17 | 0.29 | 0.34 |
| 17-1325 | 9/5/2017 | 1.67 | 1.62 | 0.27 | 1.08 | 2.16 | 0.17 | 0.29 | 0.34 |
| 17-1521 | 10/3/2017 | 1.70 | 1.62 | 0.27 | 1.08 | 2.16 | 0.17 | 0.29 | 0.34 |
| 17-1689 | 11/1/2017 | 1.23 | 1.60 | 0.28 | 1.04 | 2.16 | 0.18 | 0.29 | 0.34 |
| 17-1828 | 12/4/2017 | 1.52 | 1.60 | 0.28 | 1.05 | 2.16 | 0.17 | 0.29 | 0.34 |
| 18-5 | 1/2/2018 | 2.24 | 1.64 | 0.30 | 1.03 | 2.24 | 0.18 | 0.29 | 0.34 |
| 18-179 | 2/1/2018 | 1.71 | 1.64 | 0.30 | 1.04 | 2.25 | 0.18 | 0.29 | 0.34 |
| 18-290 | 3/1/2018 | 1.50 | 1.63 | 0.30 | 1.03 | 2.23 | 0.18 | 0.29 | 0.34 |
| 18-465 | 4/3/2018 | 1.69 | 1.64 | 0.30 | 1.04 | 2.24 | 0.18 | 0.29 | 0.34 |
| 18-653 | 5/8/2018 | 2.06 | 1.64 | 0.30 | 1.04 | 2.23 | 0.18 | 0.29 | 0.34 |
| 18-749 | 6/4/2018 | 1.59 | 1.65 | 0.29 | 1.07 | 2.23 | 0.18 | 0.29 | 0.34 |
| 18-993 | 7/11/2018 | 1.74 | 1.65 | 0.29 | 1.07 | 2.22 | 0.18 | 0.29 | 0.34 |
| 18-1099 | 8/1/2018 | 1.93 | 1.65 | 0.29 | 1.07 | 2.23 | 0.18 | 0.29 | 0.34 |

Results:

**Sample: Semi Annual Whole Eff
8G18004-01 (Water)**

General Chemistry

| | Result | Reporting Limit | Units | Date Analyzed |
|---------------------------------|-------------|--------------------|-------|------------------|
| Ammonia | 10.8 | 0.5 | mg/L | 07/24/18 |
| Kjeldahl Nitrogen | 8.6 | 5.0 | mg/L | 07/25/18 |
| Nitrate and Nitrite as N | 3.64 | 0.15 | mg/L | 07/19/18 |
| Total Dissolved Solids | 488 | 10 | mg/L | 07/20/18 |
| Total Organic Carbon | 23.0 | 1.0 | mg/L | 07/20/18 |
| Total Phosphorous | 0.65 | 0.02 | mg/L | 07/19/18 |
| Total solids (TS) | 612 | 10 | mg/L | 07/20/18 |
| Total Suspended Solids | 106 | 5 | mg/L | 07/19/18 |

Total Metals

| | Result | Reporting Limit | Units | Date Analyzed |
|-----------------------|---------------|--------------------|-------|------------------|
| Calcium | 22.7 | 0.01 | mg/L | 07/20/18 |
| Magnesium | 4.90 | 0.01 | mg/L | 07/20/18 |
| Cadmium | 0.0001 | 0.0001 | mg/L | 07/20/18 |
| Lead | 0.014 | 0.0005 | mg/L | 07/20/18 |
| Aluminum | 1.02 | 0.012 | mg/L | 07/20/18 |
| Copper | 0.037 | 0.005 | mg/L | 07/20/18 |
| Nickel | 0.005 | 0.001 | mg/L | 07/20/18 |
| Zinc | 0.224 | 0.005 | mg/L | 07/20/18 |
| Total Hardness | 76.8 | 0.0312 | mg/L | 07/20/18 |

NEW ENGLAND BIOASSAY CHAIN-OF-CUSTODY

SEMI ANNUAL "WET WEATHER"

EFFLUENT

Sampler: JAN BOK M'GOWAN
 Title: CHEMIST
 Facility: Lowell Regional Wastewater Utilities

Sampling Method: X Composite GRAB

Sample ID: _____
 Start Date: 7-17-2018 Time: 3:00 PM
 End Date: _____ Time: _____

Sampling Method: _____ Grab (for pH and TRC only _____)

Date Collected: _____
 Time Collected: _____

Sample Type: _____ Prechlorinated
X Dechlorinated
 _____ Unchlorinated
 _____ Chlorinated

Effluent Sampling Location and Procedures: Plant outfall after dechlorination. 24-hr. composite?

Receiving Water Sampling Location and Procedures: Merrimack River upstream of the plant discharge at the Hunts Fall Bridge, (Rt.38)

Requested Analysis: X Chronic and modified acute

Sample Shipment

Method of Shipment: New England Testing Labs

| | | |
|-------------------------------------|----------------------|----------------------|
| Relinquished By: <u>[Signature]</u> | Date: <u>7-18-18</u> | Time: <u>9:05 AM</u> |
| Received By: <u>[Signature]</u> | Date: <u>7-18</u> | Time: <u>905</u> |
| Relinquished By: <u>[Signature]</u> | Date: <u>7-18</u> | Time: <u>1410</u> |
| Received By: <u>[Signature]</u> | Date: <u>7-18</u> | Time: <u>1410</u> |
| Relinquished By: <u>[Signature]</u> | Date: <u>7-18</u> | Time: <u>1445</u> |
| Received By: <u>[Signature]</u> | Date: <u>7/18/18</u> | Time: <u>1445</u> |

FOR NEB USE ONLY

Received

* Please return all ice packs NEB has provided to insure accurate temperature upon receipt to the NEB laboratory *

Temperature of Effluent Upon Receipt at Lab: 3.6 °C

Temperature of Receiving Water Upon Receipt at Lab: _____ °C

Effluent COC# C38-2819

Receiving Water COC# _____

IF THIS COOLER IS MISPLACED OR THE LABEL IS LOST, PLEASE SHIP TO:
 KIM WILLS, NEW ENGLAND BIOASSAY, 77 BATSON DRIVE, MANCHESTER CT 06042